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Applicant	:	MARKUS HARTMANN and HELMUT JAROSCH
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For	:	METHOD FOR THE PRODUCTION OF A THERMOPLASTIC BOARD COMPRISING AT LEAST ONE SMOOTH EDGE, DEVICE THEREFORE, AND EDGE MACHINING SYSTEM
Art Unit	:	1742
Examiner	:	Stella Kim Yi
Customer No.	:	10037
Confirmation No:		1427

January 20, 2011

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

APPLICANTS' REPLY BRIEF

In response to the Examiner's Answer dated November 23, 20010, applicant herewith presents its Reply Brief pursuant to 37 C.F.R. 41.41.

In responding to Applicants' argument, the Examiner acknowledges Applicants' assertion that BRESSAN does not teach or suggest any process which densifies or smoothes any

surface of the exposed core in its process, and further that while BRESSAN's method does fuse two edges, these are not considered "surfaces".

The Examiner responds that BRESSAN forms a smooth edge by deflecting the free edges of the regularly arranged surfaces of the extruded structure toward each other and fusing the edges. She acknowledges that BRESSAN forms an edge by a deflection and fusion of a spaced pair of surfaces separated by a hollow space, while in the Applicants' invention the edge is formed by a densification and smoothing of the edge of a foam core board, without collapsing an empty space. The present claim 1 recites "pressing the contact surface of the smoothing device against the side edge to smooth and densify the thermoplastic synthetic material".

The Examiner asserts that BRESSAN clearly discloses a method of producing a thermoplastic plate (thermoplastic board) by heating the side edge of the plastic web by means of flanges (guide grooves) (see 10 and 10' of Figure 6) of the thermoforming device (6) (smoothing device) (Col. 5, lines 24-27) to soften and close the side edges of the sheet (Col. 5, lines 32-33; 36-39) while the adjacent peripheral

surface areas are maintained at a temperature below the softening point by cooling (Col. 4, line 59 through Col. 5, line 18). The Examiner states that the edges are clearly surfaces to be fused, a process which inherently smoothes and densifies the thermoplastic material, as described in Col. 5, lines 16-28 and Figures 4 and 6 of BRESSAN. The Examiner describes the figures, and concludes:

> "Therefore, BRESSAN does teach pressing the contact surface of the smoothing device against the side edge to smooth and densify the thermoplastic synthetic material while simultaneously maintaining adjacent peripheral surface areas of the plastic web in the smoothing device at a temperature below the softening temperature of the thermoplastic synthetic material by cooling."

In fact, there appears to be <u>no change in density</u> of the material of BRESSAN. Quite simply, the solid thermoplastic material is reconfigured, without any change in gas content or solid material, and therefore the density returns to the original level after cooling. Therefore, BRESSAN fails to teach or suggest <u>densification</u> of any material, let alone a "thermoplastic synthetic integral foam board having a coarsely porous core." The Examiner's failure to give full weight to at least the "foam" and "densify" aspects of claim 1 are significant, and the

argument that densification is "inherent" is not demonstrated by the record.

The Examiner admits that BRESSAN does not teach a foam core structure, and seeks to remedy that deficiency by relying on a secondary reference, DAY, which allegedly discloses that panel applications are commonly made from plastic extruded porous foam cores such as polyvinyl chloride (PVC) formulations (Col. 1 , lines 63-66 and Col. 2, lines 33-36). While DAY does, in some passages, recite a thermoplastic PVC foam core sheet, that sheet, as processed according to DAY, cannot be used in the process according to BRESSAN, and therefore the combination of references is not enabling for the invention. Further, there appears to be no motivation to modify BRESSAN to employ a "thermoplastic synthetic integral foam board having a coarsely porous core," and, even if one were to employ the known prior art PVC foam core sheet described by DAY (and for which the Examiner provides no motivation to combine) in the process of BRESSAN, failure would no doubt result, because of the dramatic differences between the two types of sheets. One cannot simply use a "thermoplastic synthetic integral foam board having a coarsely porous core" in a process intended

for an alveolate sheet. The Examiner has provided no particular statement as to what the proposed combination would actually look like and how it would operate.

The Examiner further asserts that DAY discloses a problem of fraying that occurs along the longitudinal edges of the web after the plastic porous foam is cut (Col. 7, lines 60-61). Applicants have particularly addressed that issue in the Appeal Brief, but reiterate here that the frayed edges referred to in the cited passage of DAY relate to <u>fibers</u> present in a curable (thermoset) resin skin formed on the sheet, and not to a thermoplastic, and thus are distinguished. DAY states:

> "Structural integration of these porous webs to skins may be enhanced beyond that achieved by simultaneous impregnation of the skins and generally flush porous webs, through expansion of the web edge portions at the area of attachment to the skins. The porous and unimpregnated webs are caused to protrude beyond the surface of the foam, <u>and if desired, these protruding edge portions may be frayed to increase the separation of their fibers</u>. When skin materials are applied to the core and pressure applied for bonding of skins to core, the protruding web fibers are caused to flare out or fold over, substantially increasing their area of contact with the skins as the impregnating resin cures. The features of porous and protruding webs and fillets may be combined if desired in the same core panel." (Col. 4, lines 52-65).
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> *   *   *
>
> "When fibrous sheets 42 are cut by a band saw, the cutting operation frays the longitudinal edges of the

> webs 62. Thus, when skins are laminated by adhesive or resin to the sides of the panel 35, there may be penetration of the adhesive or resin into the fibers to form positive bonds of the webs 62 to the skins. This fraying action is limited with webs which have been impregnated and cured with adhesive or resin, but is quite extensive for fibrous webs which have been attached to the foam by means which maintain their fibers in a substantially dry and porous state." (Col. 7, line 60-Col. 8, line 2).

When heat is applied to a thermoplastic, it softens and can be deformed. On the other hand, a curable (thermoset) resin changes chemical state upon curing and, when heated after curing, it no longer readily softens.

In fact, the Examiner seems to misapprehend the reason for the frayed edges of DAY, and whether they represent a "problem" to be solved at all. In fact, as noted above, the fraying is considered advantageous by DAY in order to facilitate joining of the panels, since the frayed fibers present an increased surface area and a high tensile strength attachment point. One would not seek to intentionally smooth the frayed edges of the panels according to DAY since, in doing so, their use would be diminished and attachment to adjacent panels made more difficult.

The Examiner concluded that it would have been obvious to one of ordinary skill in the art to have substituted the

plastic porous foam as taught by DAY for the thermoplastic material of BRESSAN for the predictable results of manufacturing a thermoplastic foam board having a coarsely porous core and to seal and smooth the frayed edges of the plastic porous foam web.

However, since the frayed edges are considered an advantage by DAY, and in any case extend from a curable (thermoset) resin layer that would not readily soften when heated, and thus would not form a smooth surface in the process, this argument must fail.

The Examiner states that BRESSAN does not specifically teach bridging the surfaces of the sheets into a curved edge. This is not true. BRESSAN in Figs. 6 and 7, shows the formation of a curved edge and states:

> "forming said parts to which heat has been transmitted during the preceding step so as to close the peripheral edges of the socalled "canes" cut by suitable trimming means preferably separated from said heat generators."
>
> * * *
>
> "According to the method and the apparatus of this invention the thermoforming assemblies are on line with the extrusion machine and provide first the softening of the peripheral edges which have been suitably cut and trimmed and then the junction thereof, thus forming the peripheral edges of a plurality of sheets subjected to said thermoforming action."
>
> * * *

"As mentioned before, in order to avoid that the alveolate cavities of sheet 1 communicate with the outside the so-called "canes" should be closed by a thermoforming process acting on the side edges of the extruded sheet. In Fig. 2, 3 and 11 there is shown a cutting and thermoforming station for the side edges of alveolate sheet 1. Sheet 1 is cut by blades 34 and 34 min at the entrance into the cutting and thermoforming station. Blade 34 longitudinally cuts sheet 1 along an axis thereof, and blades 34 min , as shown also in Fig. 5, cut and trim the edges of sheet 1, thus eliminating the selvedge which is deformed by thermal effect upon the extrusion, in order to provide two correctly aligned side edges which will be closed by the thermoforming assemblies. Sheet 1 is then passed about first deflecting rollers 32. The two halves of sheet 1 longitudinally cut by blade 34 are conveyed upwards and downwards, respectively, and passed about second deflecting rollers 33. Afterwards the cut edges of sheet 1 are subjected to a thermal action by assembly 6 which through electrical resistance 8 protected by insulator 9 produces heat which is irradiated through flanges 10 and 10 min and softens edges 4 and 4 min of sheet 1 guided between skids 11 and 11 min in which cooling water fed through conduits 41 is circulated. Sheet 1 is then passed along forming assembly 12, better shown in Fig. 7, which by means of its shaped sections 13 and 13 min joins by contact softened edges 4 and 4 min, thus closing the side edge of alveolate sheet 1. The alternative embodiment of Fig. 8 shows assembly 12 provided with ducts 14 and 15 conveying cooling air from duct 35 towards sheet 1 so that the heating action of assembly 6 does not impair the evenness of sheet surfaces and the alveolate cavities adjacent to the outer edge to be treated. According to this embodiment assembly 12 is formed of two specular halves 12a and 12b, the distance of which can be adjusted in order to adapt forming assembly 12 to the different thickness of the semifinished product 1."

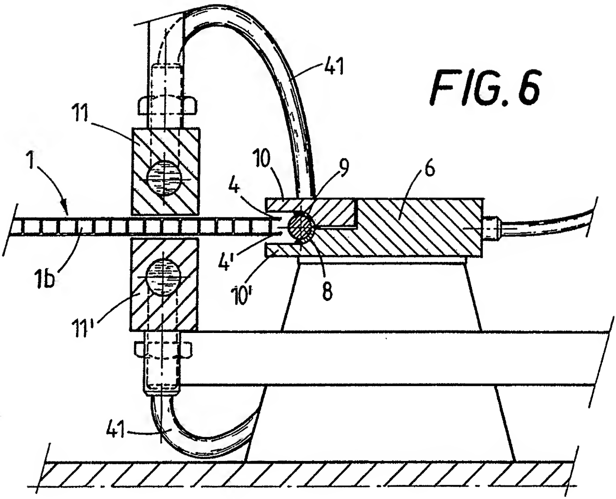
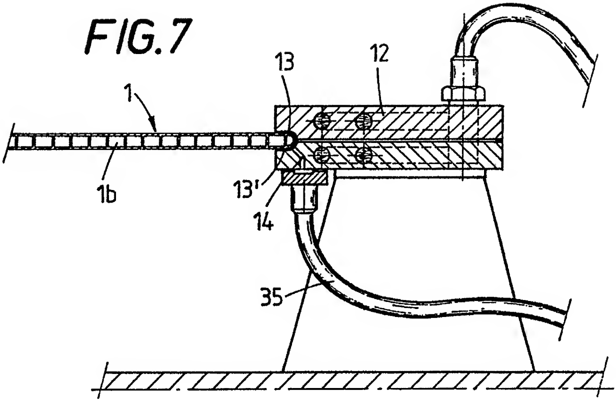


FIG. 6

FIG. 7



The Examiner proceeds in her argument that, even if BRESSAN did teach a curved edge, it would not disrupt the main body of the sheet or foam core because the smoothing device is used over the edge only, and therefore combining BRESSAN with DAY would not result in a different structure from that of the claimed invention. In fact, the technology of BRESSAN is used to close the most peripheral cells of the sheet, which are intended, for example, to act as a conduit for fluid flow. The distance from the edge to be treated depends upon the thickness of the panel, which has a

significant depth. In any case, Applicants' do not believe that there is enablement for a combination of BRESSAN and DAY as proposed by the Examiner because, if so combined, the result would be inoperative. As discussed above, it is believed that DAY teaches <u>against</u> the proposed combination, since the frayed fibers asserted by the Examiner as a problem to be solved are actually an advantage to be embraced.

Applicants argued in the Appeal Brief that, in order to employ DAY in the process of BRESSAN, the core of the DAY board would have to be hollowed out. The Examiner disagreed, stating that the plastic sheets of BRESSAN and DAY both comprise a porous core, with DAY's porous core being "foamed" being the only difference.

This argument is specious, since there are many differences, and the filled core of DAY would be incompatible with the forming process taught by BRESSAN. The process of BRESSAN is designed to bend and fuse <u>plastic sheet</u>, with a hollow core. DAY provides a foam core. The surfaces of a thermoplastic foam core sheet, such as the raw PVC foam core sheet described by DAY <u>before forming the fibrous thermoset resin films on its surface</u>, has integral

surfaces. The actual sheet of DAY, on the other hand, has curable (thermoset) resin surfaces, and thus would not accommodate a thermoforming operation after curing of the resin. Neither BRESSAN nor DAY disclose how such a process could be conducted on a thermoplastic foam core sheet having curable resin surfaces.

Applicants argued (and still maintain) that, while DAY does disclose thermo-formable foam boards, these boards are sandwiched together with the absorptive fibrous web sheets to form laminated boards which are not integral. Examiner disagreed because the definition of "integral" is something that is formed as a unit with another part. The Examiner misapprehends here that claim 1 defines the <u>material</u> of the sheet, stating a method of "manufacturing a thermoplastic synthetic integral foam board having a coarsely porous core, sealed and smoothed side surfaces and at least one sealed and smoothed side edge." In this case, the word "integral" does not permit the sealed and smoothed side surfaces to be made of a material other than a "thermoplastic synthetic".

The Examiner asserts that DAY teaches a thermoformable plastic foam core material such as polyvinyl chloride that is used in forming panel applications or plastic products

and discloses a need to seal and smoothen the edges of a foam board that is made integral with fibrous sheets.

The core of these panels may well be thermoformable, but the Examiners' assertion that the panel as a whole, including the surfaces from which the "frayed edges" extend, is thermoformable, is unsupported and, as previously discussed, is incorrect, since the surface is formed using a curable resin. Such curable resins are outside the scope of thermoplastics and typically do not soften at modest temperatures below a point where degradation or oxidation would occur. Since the panel of DAY is heterogeneous, no component of the composite meets the claim requirement of "a thermoplastic synthetic integral foam board having a coarsely porous core, sealed and smoothed side surfaces and at least one sealed and smoothed side edge." The differences are such as to make the panel of DAY unsuited for application in the process of BRESSAN or the present invention. DAY must therefore be interpreted as failing to disclose this element, or an obvious variant thereof. Since this is the very reason for the citation of DAY, the rejection itself must fail based on this same interpretation.

Finally, Applicants argued that BRESSAN fails to teach or suggest "cooling and calibrating the plastic web on a calendar roll pair to form sealed and smoothed side surfaces". The Examiner disagreed, asserting that Figure 1A shows cooling the plastic web on calendar roll pair (23,24) and correctly aligning (calibrating) the side edges prior to closing them by the thermoforming assembly (smoothing device) or pressing the contact surface of the smoothing device against the edge as described in Col. 4, lines 45-51.

This is not what BRESSAN shows. Rather, elements 23, 24 in Fig. 1A are <u>conveyor belts</u>, which are materially different than calendar rolls (Col. 6, lines 22-31):

> "The thickness of sheet 1 is successively stabilized by calibration units 21 and 22 in synergic action with the compressed air flows emitted by nozzles associated to matrix 20 and forming the alveolate structure, i. e. the cavities 1b of sheet 1 which is fed by opposed belt conveyors 23 and 24.
>
> "From belt conveyors 23 and 24 sheet 1 is guided between the opposed units 25 and 26 of an apparatus for the electroerosion of surfaces 2 and 2 min of sheet 1 which are thus prepared for the printing."

In particular, the reason to use a conveyor belt on the top and bottom surfaces of the alveolate sheet is to <u>avoid applying a high pressure</u>, and thus to avoid deforming the recently formed hollow sheet which, prior to cooling, would

be soft and pliable. On the other hand, a calendar roll is intended to apply a concentrated pressure on a sheet. The application of a calendar roll to the alveolate sheet <u>before cooling</u>, as provided in claim 1, (or even after cooling) would result in a destruction of the alveolate sheet, and is thus not consistent.

Applicants have argued that BRESSAN fails to teach or suggest "drawing off the plastic web." The Examiner disagreed because allegedly BRESSAN teaches in Col.5, lines 16-28, and in Figures 4 and 6, that the sheet 1 is then passed about first deflecting rollers 32. The two halves 101, 102 of the sheet 1 longitudinally cut by blade 34 are conveyed (drawn) upwards and downwards, respectively, and passed about second deflecting rollers 33 prior to heating the side edge of the plastic web.

As discussed above, BRESSAN does not teach or suggest the use of a calendar roll, as required by claim 1, and therefore does not disclose drawing off any sheet from a calendar roll. In fact, in context, the step of claim 1 which provides "cooling and calibrating the plastic web on a calendar roll pair to form sealed and smoothed side surfaces" is completely absent from the combination of

references, since such a roll would not be used to form the thin sheets making up the alveolate sheet of BRESSAN, that has surfaces formed by extrusion. Since there is no compression of the sheets in BRESSAN, there is no need to draw the plastic web off of the calendar roll.

In conclusion, therefore, applicants maintain that the Examiner has failed to establish a prima facie case of obviousness for the rejection of claims 1, 2 and 4.

Reversal of the rejection is respectfully requested.

Respectfully submitted,

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